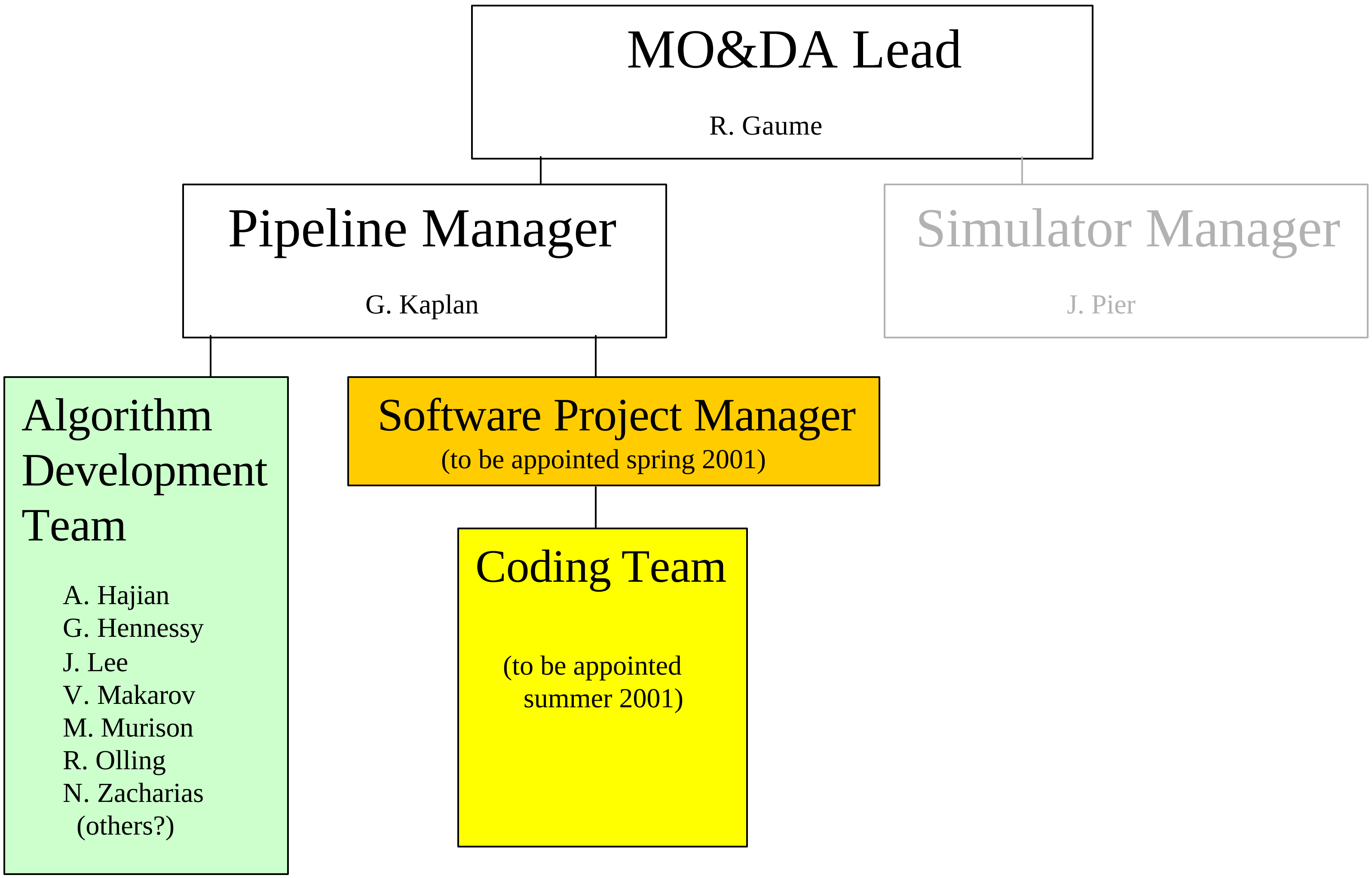
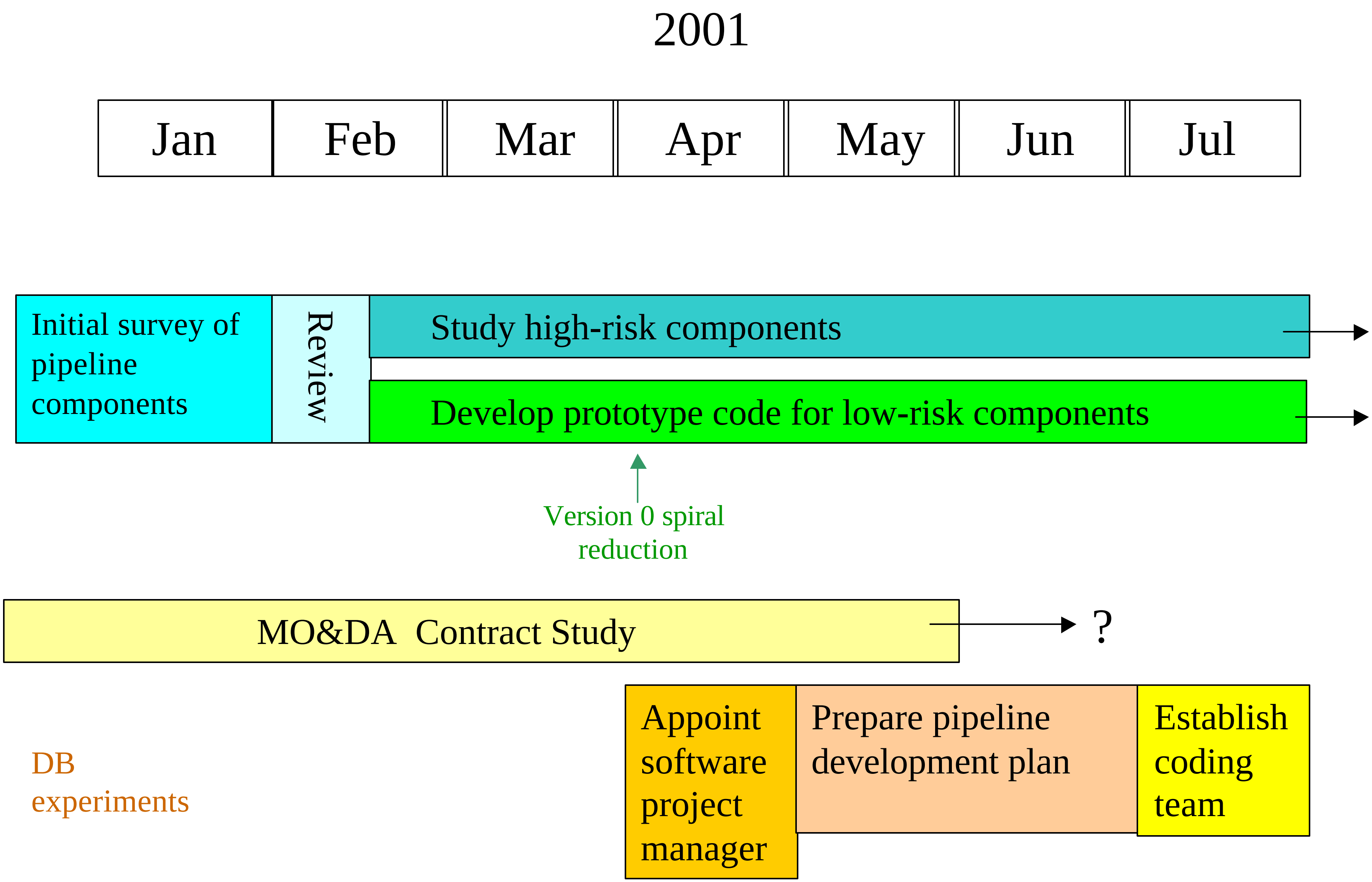
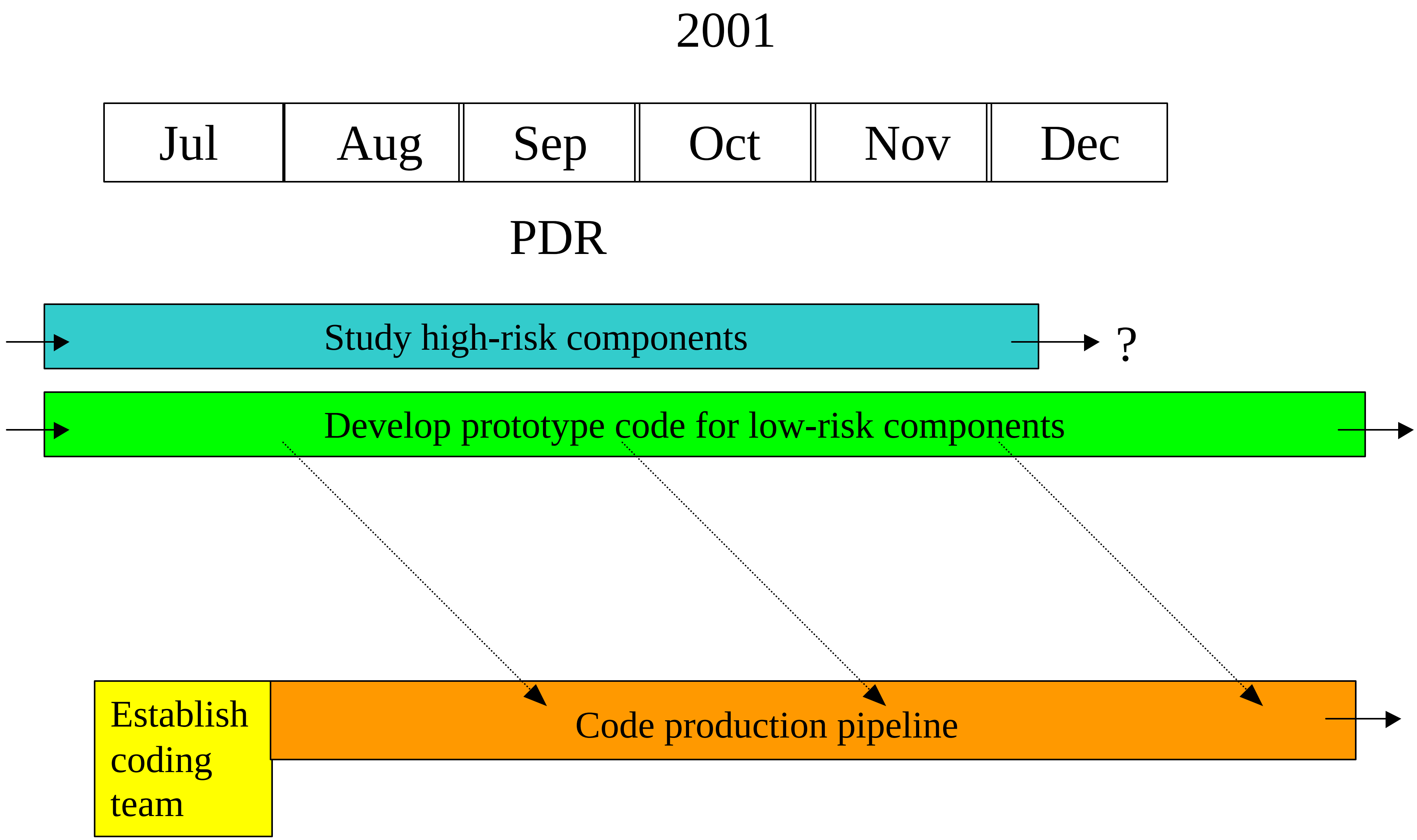
# DA Organization




2001
Jan
Feb
Mar
Apr
May
Jun
Jul
Initial survey of pipeline components
Review
Study high-risk components
Develop prototype code for low-risk components
Version 0 spiral reduction
MO&DA Contract Study
?
Appoint software project manager
Prepare pipeline development plan
Establish coding team
DB experiments


2001
Jul
Aug
Sep
Oct
Nov
Dec
PDR
Study high-risk components
?
Develop prototype code for low-risk components
Establish coding team
Code production pipeline

# Initial Survey of Pipeline Components

POA&M 5.5, Plan page10

To broadly describe, for each pipeline component:

- Input data requirements
- Subtasks
- Relationships with other components
- Approaches, models, algorithms
- Potential problem areas
    - critical info missing
    - iterative relationship(s)
    - compute intensive
    - expertise lacking
- Expected output parameters

# A Few Big Unanswered Questions

- **How detailed a knowledge do we need of the spatial and spectral variations in CCD sensitivity to do proper centroiding?**

  ⇒ i.e., how many parameters are required for this?

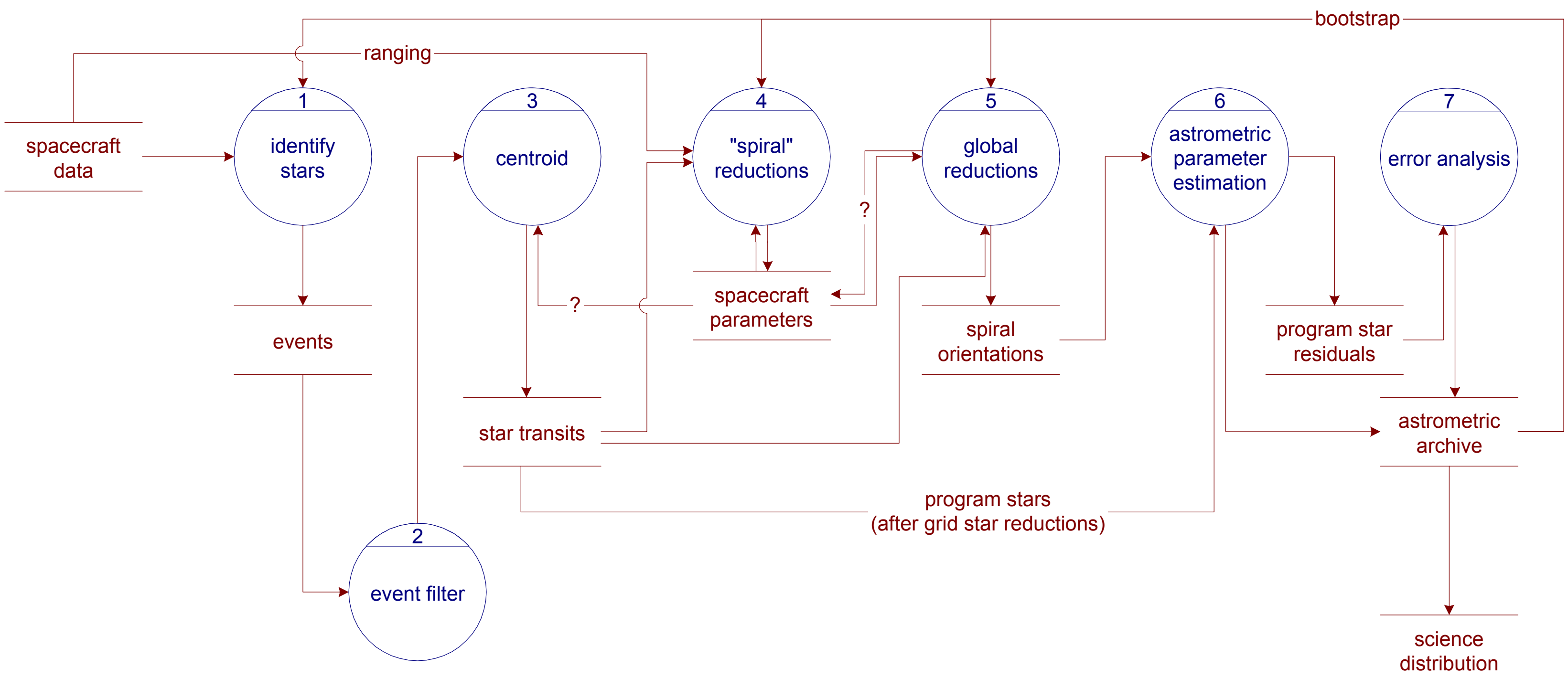
- **What is the best algorithm for centroiding?**

  ...both for minimizing systematic error and maximizing numerical stability

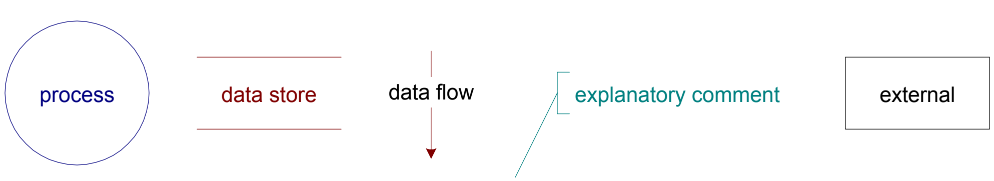
- **How rapidly will the optics change with time?  Can we construct a reasonable model that adequately characterizes the changes?**
- **What are the sources, if any, of “jitter”?  How important are other types of dynamical behavior not yet considered?**
- **Can changes in the basic angle be adequately separated from rotational variations — over the range of variations expected?**
- **Can we do absolute calibration of the photometry with so few standard candles?**
- **Will the overall scheme of iterative solutions propagate systematic errors from the input catalog (or other sources) to the final solution?**

# FAME Data Reduction Overview DFD: Astrometric Pipeline

19 March, 2001

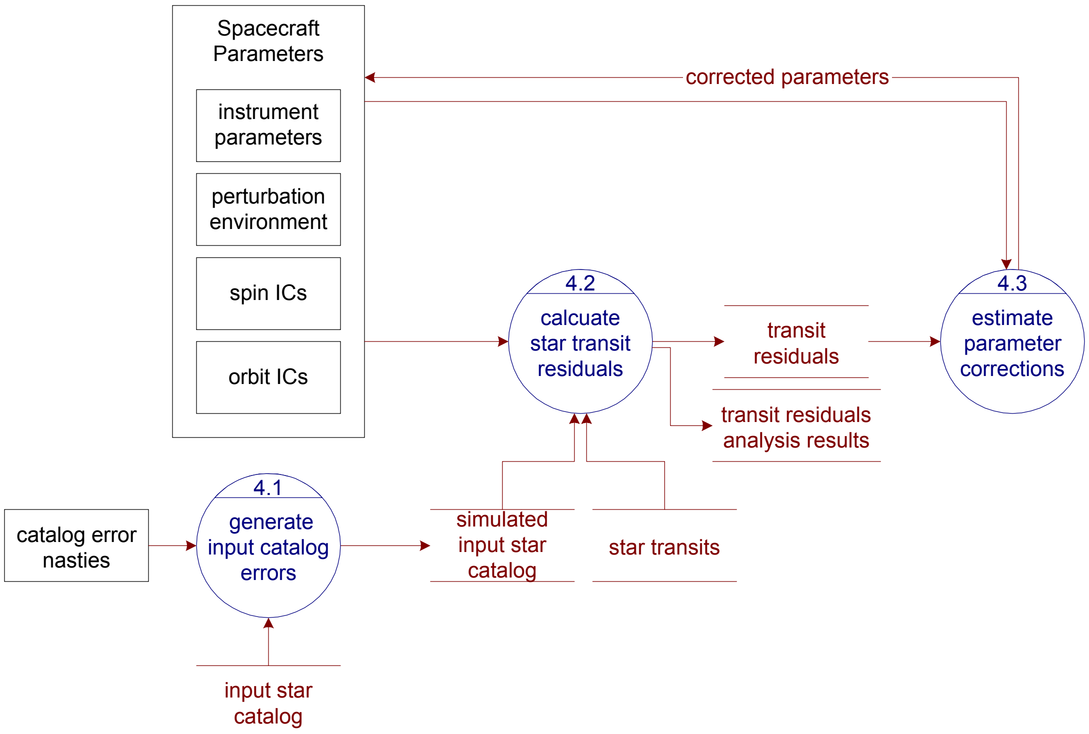



Symbol Key:



# FAME Spiral Segment Reduction DFD: Overview

19 March, 2001



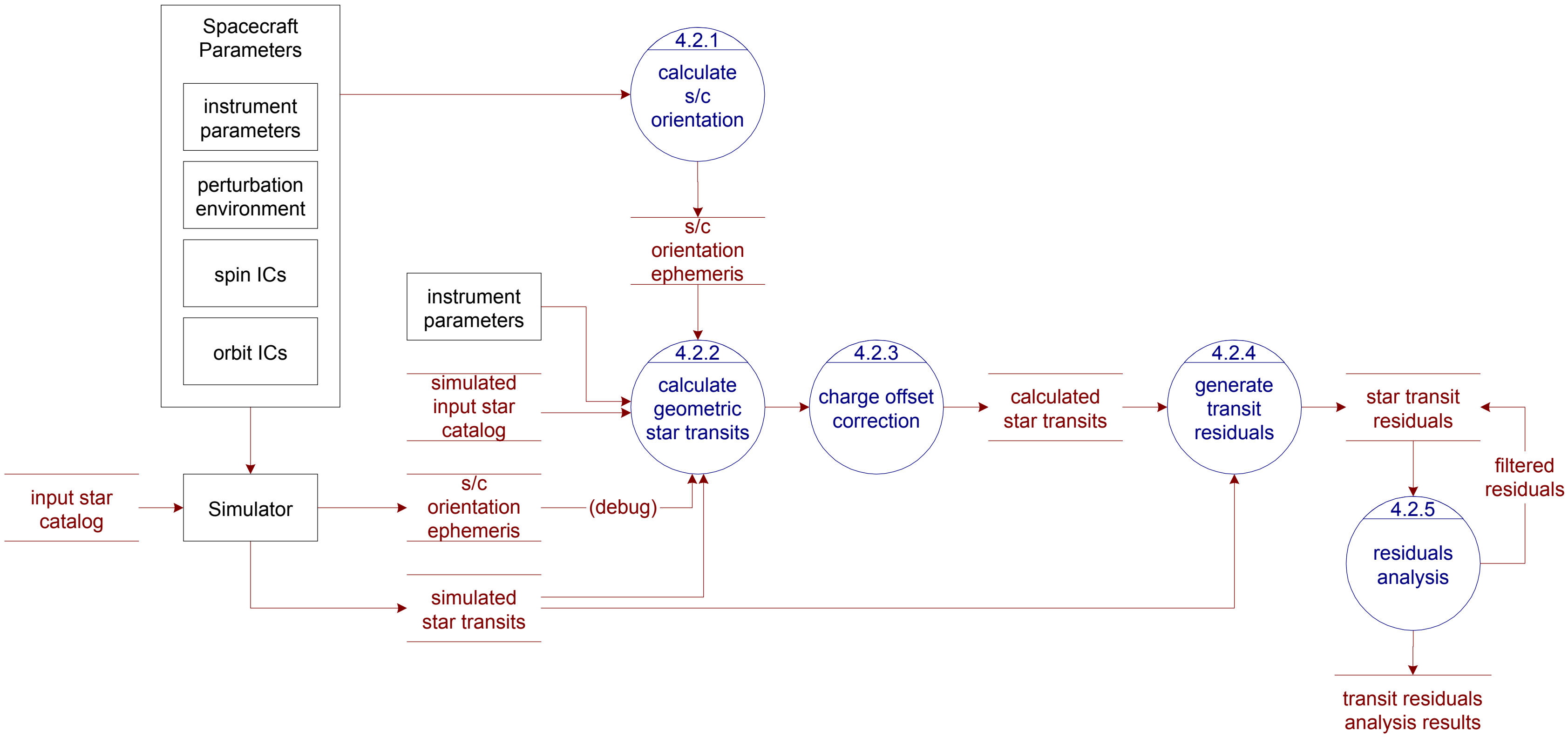

Notes

A "transit" consists of two parts: an in-scan precise timing (< 600 μas) and a less-precise (~5-15 mas) cross-scan position.

4.1. It will eventually be not only useful but essential that we introduce various kinds of errors into the input catalog. This allows us to quantify our (in)sensitivity to input catalog systematics.

# FAME Spiral Segment Reduction DFD:
# Generation of Star Transit Residuals

19 March, 2001




Process Notes

4.2.2. Here is where, on a star-by-star basis, we calculate (predict) the star transit times.

4.2.3. This module merely subtracts the predicted transit times from the "actual" transit times obtained from the Simulator (or, much later, the instrument), producing the transit residuals for a given "spiral" segment of data.

4.2.4. A frequency analysis of the transit residuals will be very illuminating.  Most systematic errors will be periodic.  This is also the place to look for outliers and other problems, before performing the parameter estimation.

# FAME Spiral Segment Reduction DFD: Calculation of Star Transits

19 March, 2001

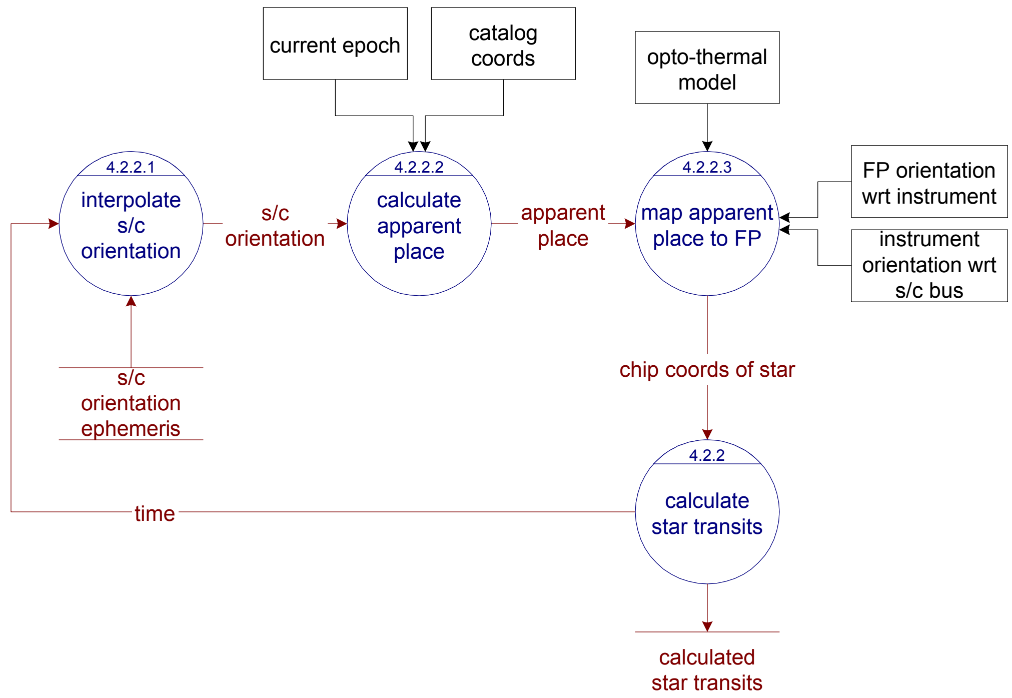
Process Notes

4.2.2.1. To start, we can use simple analytical formulas to calculate the spacecraft orientation as a function of time. Later, we can substitute numerical integrations to accomplish the same task. For a given "spiral" segment, a single, moderately high resolution integration will be done, producing an orientation ephemeris. Interpolation of the ephemeris then gives the orientation for any given time within that data segment.

4.2.2.2. This module converts catalog coordinates (equatorial and/or ecliptic) to apparent place.

4.2.2.3. This module maps apparent places to perturbed focal plane coordinates. What is needed are the opto-thermal model for the optical transformation, the spacecraft body frame orientation wrt the sky (inertial frame), the orientation of the instrument frame wrt the spacecraft bus (body) frame, and the orientation of the focal plane assembly wrt the instrument frame. There will be separate FPA orientations for the two viewports, in order to allow the plane defined by the two viewport direction vectors to be non-perpendicular to the spin axis.

4.2.2. This is the driving process. The transit calculation process is fundamentally a root-solving algorithm. The function whose root, or zero-crossing, is to be found is the displacement of a given star from a given CCD "wire" (or last row). This displacement is, via processes 4.2.2.1 through 4.2.2.3, a function of a single parameter, time. Hence, we may employ a simple one-dimensional root-finding algorithm. The modified secant algorithm is nearly as fast as Newton's method but has the advantage of always converging.



# FAME Spiral Segment Reduction DFD:
# Catalog Position to Apparent Place

19 March, 2001